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ABSTRACT

A SEEMINGLY UNRELATED REGRESSION ANALYSIS
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Increasing electricity prices have recently intensified concern regarding the effectiveness of the regulatory process. In numerous states, questions are being raised about the effectiveness of elected regulators relative to those commissioners who are appointed. The central purpose of this article is to determine whether elected or appointed regulators exert the strongest influence on electricity prices paid by residential, commercial, and industrial consumers.

Seemingly unrelated regression equations were developed for 1967, 1973, and 1979 data. The 1967 data produced evidence of a constraining influence on electricity rates by appointed regulators, relative to elected regulators. The 1973 and 1979 data, in contrast, indicated a dampening effect by elected regulators on certain electricity rates. This conflicting trend over time, however, provides relatively weak support for the hypothesis that elected regulators have been responsible for setting lower rates than appointed regulators, either in past periods of passive regulation or in the recent decade of more active regulation.

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I. INTRODUCTION

Public utility regulation has been subjected to intense criticism in recent years.[1] The adequacy of traditional regulatory objectives, such as control of earnings (prevention of monopoly profits), control of prices (prevention of excessive price discrimination), and control of service, are being challenged by external forces (Trebing, 1977). These external pressures include high rates of inflation, increasing consumer militancy, decreasing supplies of inexpensive fuels, changing technology, and increasing environmental concern. They are each partially responsible for and collectively constitute a set of circumstances which has intensified concern regarding the performance of state regulatory commissions. Although some argue that historically electric utility regulation has not been effective there is consensus that the present environment in which public utilities operate makes the regulatory task much more difficult than in the past.[2] The external pressures have forced regulators to alter behavior and practices. Yet, public discontent, in the face of persistently increasing utility bills, has intensified. This discontent is indicated in organized efforts to change the method of selecting utility regulators. Recent referenda in Ohio and Michigan, as well as strong political ferment in other states exemplify this discontent.[3] Proponents for change argue that elected commissions would better perform the regulatory function than appointed commissions. A relevant and unresolved issue is whether

the method of regulator selection influences rate levels and rate structures.

The regulatory process is inherently a political process whose outcomes vary with certain political variables. We view public utility regulation in the context of conflicting interest groups with regulators subject to political pressures from these groups. Factors such as the method of commissioner selection are presumed to affect the relative benefits (and losses) among the two primary adversary groups, producers and consumers.

In brief, regulators are presumed to be more than mediators between producers and consumers--i.e., they act in their self-interest to maximize their preference functions. Specifically, we hypothesize that directly elected regulators (reflecting relatively higher voter input to regulatory decision-making) permit lower electricity prices as compared with appointed regulators (reflecting relatively lower voter input). We hypothesize that elected regulators will reflect strong opposition to rate increases while appointed regulators will provide lesser opposition. In sum, we hypothesize that regulatory arrangement affects the regulatory outcome.

II. THEORIES OF REGULATION

Mann (1974) discussed the significance of political power in the setting of electricity rates. It is apparent that the actual regulatory environment is much more complex than most of the theoretical literature suggests; and that, as Joskow (1973) argued, actual understanding of the process can be enhanced by broadening the analytical

focus to incorporate behavioral matters. To create a conceptual framework for our analysis, alternative theories of economic regulation need to be examined.

There are several ways of categorizing the different theories of regulation. Primeaux and Nelson (1980) employed two broad categories: the benefit theory of regulation, which asserts that various interest groups control or "capture" the regulatory process; and the wealth redistribution theory of regulation which emphasizes that regulation cannot avoid cross-subsidization across user classes. Trebing (1980, 1981) used similar categories: the capture theory; the coalition building theory (regulators via cross-subsidization form political coalitions); and the equity-stability theory, in which regulators act to protect the public from the direct effects of market forces and in which equity considerations dominate efficiency goals.

The capture theory can be attributed to Stigler (1971). He asserted that regulation is generally captured by the regulated industry and is operated primarily for its benefit. However, Stigler acknowledged the potential for capture by other politically effective groups and allowed for the non-capture of regulators. The wealth redistribution theory of regulation can be attributed to Posner (1974). Regulatory behavior is influenced by various coalitions of politically effective interest groups. Thus, regulation can be perceived as a system of public finance (Posner, 1971), facilitated by internal cross-subsidization. The regulated firm is allowed to provide some services at prices less than actual cost by providing other services at prices

exceeding costs. Posner acknowledged that the cross-subsidization is generally compatible with the objectives of the regulators.

The capture theory of regulation is not necessarily in conflict with the wealth redistribution theory of regulation. The former focuses on regulators serving the interests of politically effective groups while the latter focuses on regulation as a vehicle for redistributing wealth among interest groups. Stigler and Posner concurred that regulators do not exclusively serve a single interest group, but instead make continuous decisions over time regarding whom to favor (Peltzman, 1976).

An empirical question is whether regulation makes a difference regarding price. Stigler and Friedland (1962) found, for 1912-1937, that regulation per se had no effect on average electricity rates. Jackson (1969), in a similar analysis for 1940-1960, found that regulatory variables added little to the explanatory power of an electricity price equation, except in 1960. The emergence of regulation as an important factor in the terminal year is attributed to a change in the regulatory environment. Historically, due to economies of scale and technological improvements, the trend of electric utility costs has been downward. In recent decades, the cost trend has been reversed. This reversal has altered the relationship between the regulated firms, consumers, and regulators.

III. THE RELEVANCE OF REGULATORY ARRANGEMENT

The regulatory process involves the regulated firms and the regulators, as well as other potential participants (e.g., consumer intervenors). In this context, regulators have utility functions which they

seek to maximize given the cost-rewards confronting them (Hilton, 1972). Therefore, an interesting question is whether the mode of regulator selection has an effect on electricity pricing. One might speculate that this aspect of regulatory arrangement has had a greater impact on electricity prices in the recent era of more active regulation than in the past era of more passive regulation.

Joskow (1972) constructed a model which indicated that regulators are influenced by more than capital costs in determining allowed rates of return. These factors include the reasonableness of the rate of return request, presence of intervenors (i.e., allowed rates of return were inversely related to the extent of intervenor testimony), and presence of cost of capital testimony supporting the utility's request (i.e., rates of return were positively related to the extent of supporting testimony).

Eckert (1973) examined the nature of costs and rewards confronting regulators. His proposition was that regulators have their utility functions shaped by factors such as income, regulatory tenure, post regulatory employment, and desire to please interest groups. While acknowledging that regulators pursue interests including pecuniary and political advantage, Samuels (1973) noted that different regulators pursue different objectives, which in most cases are complex and continuously changing. Russell and Shelton (1974) asserted that the interaction between regulator utility functions and external forces help explain regulator behavior. They formulate behavioral models that focus on the distribution of income between the public utility and consumers, and between user classes.

Gormley (1981) examined the question of the method of selecting commissioners. Presuming that the direct election of regulators and increased public participation are alternative means to a similar end, he asserted that less public participation should be associated with states where regulators are elected. In brief, with elected regulators, there is reduced public participation because the public presumes regulators are more responsive to the public interest. Although his empirical results tend to support this proposition, Gormley acknowledged that direct election may not achieve the anticipated effects since in a complex area such as public utility regulation, political activity may not be necessarily effective.

Hagerman and Ratchford (1978) focused on the economic and political variables that can affect allowed rates of return. Their results provide insight on the linkage of regulatory arrangement and regulatory outcome. As anticipated, economic variables such as risk, utility size, rate base valuation method, and prevailing interest rates influenced allowed rates of return. In addition, terms of commissioners were positively related to rates of return, suggesting that regulators with shorter terms have increased sensitivity to public pressure. The regulator selection method emerged as statistically insignificant and with the wrong sign. This result is inconsistent with conventional wisdom that elected commissioners are more responsive to the public interest than are appointed commissioners.

A recent study of regulatory arrangement is one by Harris and Navarro (1983). Based on a statistical analysis incorporating a single year's data (1980) and employing a singular dependent variable (average

price), the authors concluded that the apparent linkage of lower electricity rates and states having elected commissioners cannot be statistically attributed to the regulator selection method. Their conclusion is derived from a model which allegedly excludes any variable which could be influenced by the regulator selection process.

IV. METHOD OF ANALYSIS

The research objective is to determine the effect of regulatory selection on electric rates paid by consumers. In the electric utility industry, block rates are generally used to establish consumer bills. That is, all consumers for a given company, with similar utilization, are charged the same price for a given block of usage. One difficulty with using the block rates of individual firms as price data, is that the rate schedules for the different companies are not comparable either in the number of rate blocks or consumption breakpoints. Because of problems of data comparability, the Federal Energy Regulatory Commission prepares rate data which are weighted averages of rate categories; these data make a rate comparison among firms possible and are the prices employed in this study.[4]

Rates for a given electric utility firm are all established at one time; that is, all residential rates are established in conjunction with the setting of commercial and industrial rates. Consequently, ordinary least squares regressions is an inappropriate technique. In contrast, the seemingly unrelated regression approach (SUR) is appropriate when the disturbance term of one regression are correlated with the disturbance term of another regression.[5] One anticipates that such a condition exists in the electricity rate setting process.

Seven different price equations were estimated. The general model for the SUR regressions is of the form:

$$Y_1 = B_{01} + B_{11}X_1 + B_{21}X_2 + B_{31}X_3 + \ldots\ldots + B_{n1}X_n + E_1$$
$$Y_2 = B_{02} + B_{12}X_1 + B_{22}X_2 + B_{32}X_3 + \ldots\ldots + B_{n2}X_n + E_2$$
$$\vdots$$
$$Y_7 = B_{07} + B_{17}X_7 + B_{27}X_2 + B_{37}X_3 + \ldots\ldots + B_{n7}X_n + E_7$$

The firm subscript k is dropped to simplify notation.

The specific variables included in the SUR model for the seven different price equations are:

Dependent Variables:

PR_{100} = Monthly residential bill for 100 KWH ($)

PR_{500} = Monthly residential bill for 500 KWH ($)

PR_{1000} = Monthly residential bill for 1,000 KWH ($)

PC_{375} = Monthly commercial bill for 375 KWH ($)

$PC_{10,000}$ = Monthly commercial bill for 10,000 KWH ($)

$PI_{30,000}$ = Monthly industrial bill for 30,000 KWH ($)

$PI_{400,000}$ = Monthly industrial bill for 400,000 KWH ($)

Independent Variables:

DAP = Dummy variable for method of regulator selection (0 = elected; 1 = appointed)

SALES = Total KHW sales (billions)

TAX = Tax payments on electric operations per 1,000 KWH sales to ultimate consumers ($)

PEXP = Total production expense per 1,000 KWH produced ($)

DEXP = Electric distribution expense per 1,000 KWH sales to ultimate consumers ($)

FIN = Finance proxy variable; long-term debt per $1,000 of equity ($)

WAGES = Wages and salaries (millions) per 1,000,000 KWH sales ($)

PUR = Purchased power as a percent of total KWH sales

RS = KWH sales for resale (thousands)

RSCUST = Residential KWH sales per residential customer (thousands)

CSCUST = Commercial KWH sales per commercial customer (thousands)

ISCUST = Industrial KWH sales per industrial customer (thousands).

The seven price variables listed above are the dependent variables of the seven equation SUR model.[6]

A key variable is the dummy variable used to isolate the differential effect of method of regulator selection (DAP) on electricity prices, holding numerous cost, demand and environmental conditions constant. This variable should take a positive sign if appointed regulators allow higher rates than elected regulators.

SALES is a scale variable included to take utility size difference into consideration. To the extent that economies of scale accrue to larger utilities, this variable should take a negative sign. TAX, PEXP, DEXP represent tax, production, and distribution expenses, incurred by the utility firm. All three of these variables should take positive signs.

FIN is included to isolate the effect of financial structure on the price paid for electricity. FIN is important because finance will affect an electric utility's price structure by either causing prices

to be lower if financial leverage is beneficial to the consumer or it may cause consumer prices to be higher if the leverage becomes excessive, as many utility executives believe. The direction of the sign for this variable is not self-evident. For a firm which is too highly levered, the sign should be positive. For other firms, the sign should be negative.

WAGES represent firm wage and salary levels. This variable is included to hold regional differences constant. As noted later, a number of firms in the sample are located in the South. Consequently, wage rates will tend to neutralize regional differences in utility cost of operations. This variable should take a positive sign.

RSCUST, CSCUST and ISCUST represent residential, commercial and industrial consumption per customer. These variables are included to isolate the price effects of different levels of usage by consumer types. These variables should take positive signs; i.e., the higher the consumer usage, the higher the price.

PUR represents a purchased power variable and RS is a sales-for-resale variable. These variables are included to consider firm differences both in terms of dependence upon other firms for electricity supply and as buyers of electricity produced for resale. The effect of these actions on consumer prices depends upon whether the buying firm is paying a relatively high or low price for purchased power; similarly, consumer prices may also be affected by the price received for exported power. The latter effect would be caused by the utility charging relatively high or low prices to resale customers. In either case, these

variables should affect consumer prices, although the direction of the expected sign is ambiguous.

We anticipate DAP to be positively related to electricity price, hypothesizing that elected regulators are more sensitive to political pressure than are appointed commissioners. That is, we presume that elected regulators are subject to direct voter displeasure on matters of electricity rates. In contrast, decisions of appointed regulators affect those parties (governor, legislature) that have appointed them; however, since these selectors are confronted with numerous election issues, this reduces the importance of regulatory decisions in the electoral process. In this context, elected regulators should permit lower rate increases than appointed regulators. In brief, we anticipate this outcome due to the presumption of relatively higher public opposition to rate increases reflected through directly elected regulators as compared to the lesser opposition reflected through appointed regulators.

Joskow (1974) designated 1969 as the switchpoint in electric utility regulation. Prior to 1969, given minimal inflation offset by technological innovation and the attainment of economies of scale, electric utilities requested few rate of return reviews. After 1969, given rapid inflation not counterbalanced by economies of scale and technological change, there was a substantial increase in rate increase requests. The use of multiple cross-sectional regressions should both enhance the validity of the empirical results, as well as test the hypothesis that regulatory arrangement had lesser impact on electricity rates in the era of more passive regulation (prior to 1969) than it has had in the

recent decade of more active regulation. The years 1967, 1973 and 1979 were selected for examination.

The sample consists of 73 privately-owned firms for 1967 (14 in jurisdictions selecting utility commissioners by election; 59 being in states where regulators are appointed). The 1973 sample consists of 72 firms (14 in states where commission members are elected; 58 from jurisdictions where regulators are appointed). The 1979 sample is made up of 71 firms (14 in states where commissioners are chosen by election; 57 in states where regulators are appointed).

The sample includes only those electric utilities that: (1) provide service to industrial and commercial as well as residential customers, and (2) provide service within a single state in which there was state regulatory jurisdiction over privately-owned electric utilities, for the years 1967, 1973, and 1979. States electing commissioners and represented in the sample (with number of utilities in parentheses) include Alabama (1), Arizona (2), Florida (4), Georgia (2), Louisiana (2), Mississippi (2), and Oklahoma (1).[7]

Electricity prices were employed as the dependent variables, as opposed to rate of return. While allowed rate of return is an important indicator of regulatory influence, this profit measure as a dependent variable poses several problems. First, the actual rate of return varies with whether or not the electric utility is successful in achieving its permitted rate of return. Second, the electric utility may be willing to violate the constraint of the allowed rate of return since the regulatory agency has limited reaction options. Third, as indicated by Hagerman and Ratchford (1978), allowed rates of return are

affected primarily by variables such as utility size, rate base valuation method, and prevailing interest rates; electricity price may be more sensitive to regulatory arrangement and thus worth examining. Moreover, as Joskow (1974) noted, regulators tend to focus on price rather than rate of return.

V. REGULATOR SELECTION AND ELECTRICITY PRICES

Table 1 presents the mean values for the variables in the analysis of electricity bills. The mean statistics clearly show the substantial increases in electricity rates and electricity production costs that have occurred since 1973. In contrast, the increases in electricity rates and costs between 1967 and 1973 were relatively small.

Tables 2 through 7 present the regression results for the rate categories examined. There are three residential equations, two commercial equations and two industrial equations for each of the three years. The overall results indicate that the method of regulator selection does not have a significant and consistent impact on electricity prices.

1967 Results

The most significant price impact was observed in 1967; yet, the effect was not general or consistent. As Table 2 shows, during that year, DAP was negative and statistically significant for both the 500 and 1,000 KWH residential rate categories, indicating that during the 1967 period, appointed regulators tended to set lower residential rates than elected regulators; the 100 KWH rate, however, was unaffected by method of regulator selection.

Table 3 shows that the 375 KWH commercial rate was also reduced by appointed regulators compared with elected regulators. Other commercial and residential rates for 1967, however, were unaffected by the method of selection.

The signs on the statistically significant variables in the 1967 equations were generally in the expected direction. However, in Table 2, RSCUST is negative and statistically significant at the one percent level in equation 3. Also, WAGES is negative and statistically significant in equations 5, 6, and 7; the level of significance ranged from three to six percent.

1973 Results

Tables 4 and 5 present the equations for 1973. Table 4 shows that the only residential rate affected by method of regulator selection was the 100 KWH price. In contrast to the 1967 results, this rate was higher when regulators were appointed than where they were elected. The only other rates affected by method of regulator selection were the 30,000 and 400,000 KWH industrial rates. The data show that these rates were both higher where regulators were appointed compared with situations where regulators were elected. In 1973, the signs for DAP were all positive, indicating some upward pressure on rates whenever regulators were appointed, compared with when they were elected.

The signs on most of the statistically significant variables in the 1973 equations were in the expected direction; the one exception was the RSCUST variable in equation 10, Table 4, which was negative and statistically significant at the ten percent level.

1979 Results

The signs on most of the statistically significant variables in the 1979 equations were in the expected direction; the one exception was the DEXP variable in equation 17 in Table 6. This sign was negative and statistically significant at the three percent level.

Tables 6 and 7 reveal that none of the seven rates were affected by method of regulator selection in 1979. However, the signs on all but one of the regulator selection dummy variables were positive, indicating some upward pressure on all rates where regulators were appointed compared with jurisdictions where they were elected. As mentioned earlier, in 1973 all but one of the selection dummy variable coefficients were positive, indicating some upward pressure on rates where regulators are appointed. That upward pressure continued through 1979.

Overall, the results show that the method of regulator selection does not seem to have a significant effect on electricity rates; consequently, the primary hypothesis of this study is not validated. Yet, the direction in the movement of relative rates through time is consistent with our expectations. Nevertheless, we expected the magnitude of the movement, or shifts in the importance of method of regulator selection, to be more important than the research results show. This expectation was based on the external pressures which have emerged since 1967 to which elected regulators would seem to be more sensitive than regulators selected by appointment. While the direction of the change is consistent with our expectations, as reflected in the empirical data, the magnitude of the differential reaction was much smaller than expected. Indeed, the reaction to external pressure was insufficient

to cause elected regulators to set rates which were statistically lower than those set by appointed regulators.

The Potential for Multicollinearity

Maddala (1977) notes that multicollinearity is serious if deletions or additions of sample observations produce large changes in the regression coefficient estimates. In an attempt to determine whether multicollinearity affected the statistical results, we employed a procedure partially adapted from Maddala's discussion.

Three variations of the sample were tried. The first variation was a selection of five observations to be eliminated from each year of the original sample. This elimination amounted to six to seven percent of the observations, depending upon the year used to compute the percentage reduction. The candidates for omission were selected by the use of a table of random numbers; three firms from states which appointed regulators and two firms from states which elected regulators were omitted.

In the second variation, an alternative group of five firms was eliminated from the sample. The five firms eliminated in the first variation were restored to the sample. As in the first variation, firms omitted were selected by the use of a table of random numbers. All firms selected for this reduction were located in states which appointed regulators. The third variation consisted of the combined elimination of both sample subsets discussed above. This reduction amounted to approximately 14 percent of the total number of observations in the original sample; the sample reduction was composed of two firms from states which elected regulators and eight firms from states which appointed regulators.

The seven equation SUR model was run for each of the three sample variations for each of the three years. The results indicated that the sample variations affected the regulator selection dummy variable (DAP) only minimally; since DAP is the variable of most importance in answering the questions raised by this research, multicollinearity did not seem to be causing serious problems. For example, 63 additional equations were estimated; the dummy variable results deviated from that at the original sample in only seven cases. That is, the DAP results in all reduced sample variations were quite consistent with those of the same equations run with the whole sample. This consistency was both in terms of statistical significance as well as in terms of the signs for the DAP coefficients. On the basis of this consistency, one can reasonably conclude that the equations from the original sample were not seriously affected by multicollinearity.

VI. CONCLUSION

An underlying premise herein is that regulators are an important third party in the regulatory process; they are not simply mediators between producers and consumers. They are a group motivated by multiple factors and along with producers and consumers, seek to achieve certain benefits from the regulatory-political process. In this context, our focus has been on the linkage between regulator selection and regulatory outcome.

The regressions employing the 1967, 1973, and 1979 data indicate a trend in the relationship between the method of regulator selection and electricity rates. The 1967 data produced evidence of some constraining influence on electricity rates by appointed regulators, relative to

elected regulators. This was contrary to our expectations. The 1973 and 1979 data produced weak evidence of a dampening effect on electricity rates by elected regulators. This trend, however, was too weak to lend support to the hypothesis that regulatory arrangement had an important impact on rates either in the past era of passive regulation or in the recent decade of more active regulation. That is, there is little evidence that elected regulators set substantially lower rates than appointed regulators.

The lack of a consistent and strong association between selection method and electricity prices can possibly be attributed to several factors. First, direct election of regulators may have the same apparent effect as the substitution of public for private ownership of public utilities. That is, public interest and participation in regulatory matters may decrease since consumers may assume (incorrectly in some cases) that elected regulators will automatically act in their interests. Second, regulators may not actually have the flexibility necessary in setting rates and are unable to behave as our primary hypothesis dictates. The discretion of public utility commissioners is not only circumscribed by factors outside their control (e.g., energy prices) but also by legislated administrative procedures, judicial review, and federal legislation. Third, the effectiveness of state regulators is partly a function of staff competence and resources. An understaffed and inadequately funded commission encounters difficulty in monitoring public utility performance and in evaluating the appropriateness of rate hike requests.

FOOTNOTES

[1]For example see Phillips (1975).

[2]For example see Stigler-Friedland (1962).

[3]In Illinois, there has been movement to change from appointed public utility commissioners to elected regulators (Chicago Tribune, March 6, 1979). Similarly, in Michigan, there has been pressure for a change from appointed to elected commissioners (Lansing State Journal, December 18, 1980). In a Public Utility Regulatory Policies Act (PURPA) hearing before the West Virginia Public Service Commission involving Appalachian Power Company, several consumers conveyed belief in the notion that, "where PSC officials are appointed, the rate demands of the electric utilities are met; where PSC officials are elected by the public, the rate demands of the electric utilities are rejected." The West Virginia Legislature held public hearings on the selection of public utility commissioners (Morgantown Dominion-Post, January 21, 1982).

[4]Typical Electric Bills, Federal Energy Regulatory Commission (formerly Federal Power Commission), for various years. Typical electric bills for an individual electric utility are recorded for each city served. In general, the bills are the same, but where differences existed, the modal bill was selected.

[5]The SUR model is an improvement over ordinary least squares (OLS) when contemporaneous correlation of the error terms is present. Since SUR uses more information than OLS, there is an efficiency gain in the estimating process.

[6]Data sources for price data were discussed earlier. Data for cost, customer characteristics, operating levels, and financial characteristics were taken from Statistics of Privately Owned Electric Utilities in the United States, Federal Energy Regulatory Commission (formerly Federal Power Commission), for various years. The state per capita income data are from the Statistical Abstract of the United States. Company data for salaries and wages are from Compustat tapes.

[7]In 1967, public utility commissioners were directly elected in 14 states; the same was true for 1973. In the remaining states, commissioners are appointed by the governor, except in South Carolina and Virginia, where they are appointed by the legislature. The statistics regarding the number of states with direct elections (14) are somewhat misleading. For example, Minnesota made the transition from elected to appointed commissioners during the period 1967-1976; by 1976, the Minnesota PSC was fully composed of appointed commissioners. Since Minnesota did not commence regulation of electric utilities until

January 1975, utilities serving Minnesota were excluded from our analysis. Similarly, Texas and South Dakota (elected states) did not initiate regulation of electric utilities until 1976; electric utilities serving these states were excluded from the analysis. Nebraska (an elected state) does not have any investor-owned electric utilities serving the state. Montana and North Dakota (elected states) were not represented in the sample since no privately-owned electrics serve either of those states exclusively. Finally, Florida changed from elected to appointed regulators in January 1979. Given the lags in the rate review process, Florida was retained in the elected category for 1979.

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TABLE 1

MEAN VALUES FOR ALL VARIABLES

	1967	1973	1979
PR100	4.073	4.755	7.471
PR500	10.560	12.540	23.620
PR1000	18.767	22.139	43.454
PC375	14.579	17.231	27.524
PC10,000	234.595	282.280	501.047
PI30,000	487.630	605.708	1,208.750
PI400,000	4,918.000	6,270.000	13,805.000
DAP	.808	.806	.803
SALES	9.071	11.368	13.113
TAX	3.666	2.938	4.180
PEXP	4.418	7.230	20.853
DEXP	1.261	1.294	1.829
FIN	1.381	1.489	1.362
WAGES	2.719	3.200	4.200
PUR	.224	.227	.258
RS	.082	.079	.090
RSCUST	5.270	7.740	8.045
CSCUST	31.722	49.815	53.984
ISCUST	3,963.000	4,592.000	4,570.000

TABLE 2

SUR EQUATIONS
RESIDENTIAL RATES
1967

Independent Variables	Dependent Variables (1) PR100	(2) PR500	N=73 (3) PR1000
DAP	-.2243 (.1998)	-1.0719 (.4320)*	-1.4304 (.6482)*
SALES	-.0024 (.0037)	.0029 (.0081)	-.0051 (.0122)
TAX	.1298 (.063)**	.8549 (.1484)*	.9445 (.2226)*
PEXP	.0354 (.0748)	.2881 (.1620)**	.4136 (.2431)**
DEXP	.1822 (.2392)	.5265 (.5165)	1.2575 (.7749)**
FIN	.3455 (.2548)***	.9169 (.5504)**	.6202 (.8258)
WAGES	.1377 (.1496)	-.1284 (.3233)	.3531 (.4851)
PUR	-.1736 (.3578)	-.4806 (.7729)	-.8614 (1.1596)
RS	-.0892 (.7241)	-2.5699 (1.5634)**	-4.5976 (2.3456)**
RSCUST	-.0264 (.0373)	.0581 (.0907)	-.2984 (.1365)*
CONSTANT	2.7482	5.4218	14.3778

Standard errors are in parentheses.

*Significant at 1 percent confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).

TABLE 3

SUR EQUATIONS
COMMERCIAL AND INDUSTRIAL RATES
1967

Independent Variables	Dependent Variables			N=73
	COMMERCIAL		INDUSTRIAL	
	(4) PC375	(5) PC10,000	(6) PI30,000	(7) PI400,000
DAP	-1.5994	-12.7697	1.9419	-83.1378
	(1.2313)***	(18.7709)	(38.2516)	(387.4180)
SALES	-.0141	.0888	-.2205	-1.5714
	(.0229)	(.3500)	(.7118)	(7.2099)
TAX	-.2125	2.1154	40.6527	335.0570
	(.4151)	(6.3287)	(12.8979)*	(130.6320)*
PEXP	.1854	11.1712	13.1620	284.0910
	(.4585)	(6.9904)**	(14.2445)	(144.2690)**
DEXP	3.7807	63.3997	78.8804	668.7820
	(1.4790)*	(22.5463)*	(45.9458)**	(465.3490)***
FIN	-3.2322	-45.8680	-73.5842	-841.3290
	(1.5782)**	(24.0596)**	(48.9283)***	(495.5640)**
WAGES	-.5986	-25.1506	-53.3148	-442.4540
	(.9259)	(14.1154)**	(28.7270)**	(290.9290)***
PUR	-3.4620	-80.6201	-127.2000	-1678.0500
	(2.2143)**	(33.7558)*	(68.7226)**	(696.0230)*
RS	5.9083	70.3597	92.4320	-342.3570
	(4.4885)***	(68.4243)	(140.7000)	(1424.3200)
CSCUST	-.0134	.3465		
	(.0212)	(.3266)		
ISCUST			.0005	-.0070
			(.0013)	(.0133)
CONSTANT	18.0028	237.6980	446.7570	4469.9400

Standard errors are in parentheses.

*Significant at 1 percent confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).

TABLE 4

SUR EQUATIONS
RESIDENTIAL RATES
1973

Independent Variables	Dependent Variables (8) PR100	(9) PR500	N=72 (10) PR1000
DAP	.6237 (.2681)*	.5747 (.5538)	.3362 (.8322)
SALES	.0026 (.0082)	.0153 (.0168)	.0083 (.0252)
TAX	.1007 (.0821)	.5561 (.1680)*	.6836 (.2515)*
PEXP	.0792 (.0425)**	.2211 (.0869)*	.4438 (.1300)*
DEXP	.4442 (.2426)**	.9214 (.4952)**	1.5456 (.7407)*
FIN	.3074 (.3883)	-.5363 (.7923)	-.3676 (1.1848)
WAGES	.0203 (.0252)	-.0424 (.0515)	-.0325 (.0769)
PUR	-.1660 (.3547)	-1.2248 (.7227)**	-2.7167 (1.0801)*
RS	2.1828 (1.2372)**	.5958 (2.5204)	.1481 (3.7668)
RSCUST	.0492 (.0383)***	.1556 (.0866)**	-.1695 (.1344)***
CONSTANT	1.7401	7.4403	17.1263

Standard errors are in parentheses.

*Significant at 1 percent confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).

TABLE 5

SUR EQUATIONS
COMMERCIAL AND INDUSTRIAL RATES
1973

Independent Variables	Dependent Variables			N=72
	COMMERCIAL		INDUSTRIAL	
	(11) PC375	(12) PC10,000	(13) PI30,000	(14) PI400,000
DAP	.6225 (.9045)	11.5122 (12.8608)	35.8358 (25.9907)***	735.6230 (322.6040)*
SALES	-.0091 (.0295)	.2696 (.4204)	.4166 (.8527)	-1.5949 (10.5840)
TAX	.3364 (.2889)	10.6253 (4.1056)*	45.5089 (8.2962)*	467.3370 (102.9580)*
PEXP	.5488 (.1514)*	7.0509 (2.1516)*	17.4636 (4.3542)*	254.4410 (54.0418)*
DEXP	2.0564 (.8690)*	28.9334 (12.3654)*	-25.1163 (25.2887)	15.6585 (314.1110)
FIN	1.5981 (1.3827)	-15.9105 (19.6485)	-11.1177 (39.7435)	-220.4730 (493.2440)
WAGES	.0989 (.0911)	.0578 (.1297)	1.1433 (2.6600)	-16.7584 (33.0425)
PUR	-2.1862 (1.2705)**	-50.7016 (18.0530)*	-61.2100 (36.5008)**	-1250.2000 (452.9900)*
RS	10.6608 (4.4339)*	16.4122 (63.0052)	126.0510 (129.7230)	1190.7300 (1611.1500)
CSCUST	.0374 (.0151)*	.6499 (.2329)*		
ISCUST			.0001 (.0012)	.0091 (.0159)
CONSTANT	4.3025	151.6540	360.7790	2994.0800

Standard errors are in parentheses.

*Significant at 1 percent confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).

TABLE 6

SUR EQUATIONS
RESIDENTIAL RATES
1979

Independent Variables	Dependent Variables		N=71
	(15) PR100	(16) PR500	(17) PR1000
DAP	.1008	.7534	1.4607
	(.5547)	(1.2629)	(2.0284)
SALES	-.0320	-.0864	-.0899
	(.0130)*	(.0294)*	(.0482)**
TAX	.2714	.9460	1.4720
	(.0735)*	(.1661)*	(.2723)*
PEXP	.0317	.2532	.6342
	(.0311)	(.0707)*	(.1147)*
DEXP	-.0772	-.4732	-1.3197
	(.2015)	(.4555)	(.7462)**
FIN	-.4076	-1.9292	-2.8834
	(.5881)	(1.3316)***	(2.1729)***
WAGES	.1472	.8610	1.8914
	(.1540)	(.3486)*	(.5697)*
PUR	.2066	-1.6908	-5.2243
	(.6182)	(1.3975)	(2.2906)*
RS	-2.3450	-7.3879	-10.2877
	(1.8413)***	(4.1640)**	(6.8165)***
RSCUST	.1167	.3006	.2729
	(.1103)	(.2555)	(.3893)
CONSTANT	5.3094	13.4702	22.5503

Standard errors are in parentheses.

*Significant at 1 percent confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).

TABLE 7

SUR EQUATIONS
COMMERCIAL AND INDUSTRIAL RATES
1979

Independent Variables	Dependent Variables			N=71
	COMMERCIAL		INDUSTRIAL	
	(18) PC375	(19) PC10,000	(20) PI30,000	(21) PI400,000
DAP	-.2988	12.7370	18.8240	966.9600
	(2.1562)	(35.7404)	(88.4441)	(1078.3700)
SALES	-.0857	-.1441	1.2506	24.2293
	(.0591)***	(.9803)	(2.4399)	(29.8086)
TAX	.0651	8.7747	20.7011	254.1060
	(.3392)	(5.6175)**	(13.8471)***	(168.8610)***
PEXP	.1319	4.1641	9.3947	159.4870
	(.1319)	(2.1879)**	(5.4280)**	(66.2101)*
DEXP	.4433	-4.4376	-35.8515	-394.0720
	(.9198)	(15.2555)	(37.8820)	(462.1180)
FIN	.6320	-5.6709	-117.3450	-1436.0000
	(2.6057)	(43.2165)	(107.2260)	(1307.5500)
WAGES	1.4699	25.5597	70.5881	847.3700
	(.6957)*	(11.5172)*	(28.3796)*	(346.1600)*
PUR	-5.2632	-105.0320	-304.3420	-3378.9800
	(2.8357)**	(47.0076)*	(116.3210)*	(1417.9500)*
RS	-3.9062	-11.2578	159.2830	3548.2300
	(8.3527)	(138.5260)	(344.0430)	(4197.7100)
CSCUST	.0164	.1776		
	(.0275)	(.4068)		
ISCUST			.0040	.0760
			(.0025)**	(.0382)**
CONSTANT	18.8352	296.0810	868.9870	7641.1200

Standard errors are in parentheses.

*Significant at 1 percent. confidence level (one-tailed test).
**Significant at 5 percent confidence level (one-tailed test).
***Significant at 10 percent confidence level (one-tailed test).